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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : D06N 7/00, B32B 5/22 — A1

(11) International Publication Number: WO 96/22414

(43) International Publication Date: 25 July 1996 (25.07.96)

(21) International Application Number: PCT/US96/00329

(22) International Filing Date: 11 January 1996 (11.01.96)

(30) Priority Data:
08/373,997 18 January 1995 (18.01.95) US
08/539,386 5 October 1995 (05.10.95) US

(71) Applicant: E.I. DU PONT DE NEMOURS AND COMPANY [US/US]; 1007 Market Street, Wilmington, DE 19898 (US).

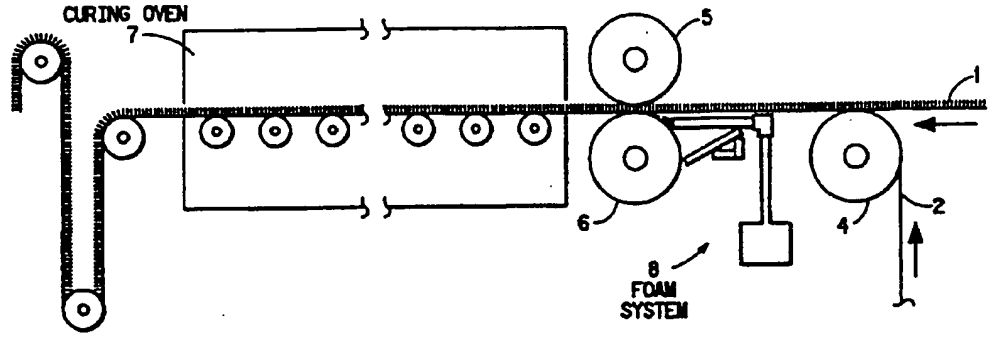
(72) Inventors: MATERNIAK, Joyce, Monson; 117 Cheltenham Road, Hockessin, DE 19707-1807 (US). MURPHY, Peter, Michael; 5024 Branston Road, Ooltewah, TN 37363-8477 (US). VINOD, Yashavant, Vinayak; 6 Farm House Circle, Hockessin, DE 19707-1426 (US).

(74) Agents: SULLIVAN, Daniel, W. et al.; E.I. du Pont de Nemours and Company, Legal Patent Records Center, 1007 Market Street, Wilmington, DE 19898 (US).

(81) Designated States: AU, CA, CN, JP, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

Published
With international search report.
Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.

(54) Title: METHOD FOR MAKING A CARPET HAVING A COATED SECONDARY BACKING



(57) Abstract

This invention relates to a method for making a carpet having a primary backing which is permeable to liquids and a secondary backing which is substantially impervious to liquids. The method involves applying a continuous coating of hydrophobic polymeric latex to the outer surface of a secondary backing material. The hydrophobic polymeric latex coating may be a modified latex containing fluorochemicals mixed therein.

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TITLE

METHOD FOR MAKING A CARPET HAVING A COATED SECONDARY BACKING

BACKGROUND OF THE INVENTION

Cross-Reference to Related Applications

This application is a continuation-in-part of U.S. Patent Application Serial No. 08/373,997, filed January 18, 1995, now abandoned.

Field of the Invention

This invention relates to a method for making a carpet having a primary backing which is permeable to liquids and a secondary backing which is substantially impervious to liquids. The method involves applying a continuous coating of hydrophobic polymeric latex to the outer surface of a secondary backing material. The hydrophobic polymeric latex may be a modified latex containing fluorochemicals or repellent finishes dispersed therein. The invention also encompasses carpets made from such a method.

Description of Related Art

The majority of residential and commercial carpets are constructed in the following general manner. Carpet pile yarn is first inserted through a primary backing fabric to form tufts of yarn projecting from the surface of the fabric. The carpet is then dyed. The primary backing is then coated with an adhesive latex to lock the yarn tufts in place and to provide an adhesive for a secondary backing fabric. The latex-coated primary backing is then bonded to the secondary backing to form a laminated backing structure.

However, one problem with the above-described carpets is their susceptibility to penetration by liquids. For instance, if water, a water-based liquid (soda pop,

coffee, urine, etc.), or another type of liquid (e.g., oil-based) is spilled on the carpet face, it may permeate through the primary and secondary backings and onto the underlying material (carpet underpad, hardwood floors, etc.). The underlying material may become stained and deteriorate over a period of time. Mildew may also grow on the backing and underlying material.

Those skilled in the trade have considered different ways for manufacturing carpets in order to reduce the permeability of liquids through the primary backing material.

One method involves applying a fluorochemical or other water-repellent agent onto the face fiber of the carpet during the fiber-forming or carpet-manufacturing process. In such instances, the fluorochemicals serve to reduce the wettability of the fibers in the finished carpet such that a spilled liquid will initially "bead" on the surface of the fiber. However, if the beaded liquid is not promptly removed, it will eventually be absorbed by the fibers and may penetrate through the primary backing.

Another method for making the primary backing impervious to liquids involves mixing fluorochemicals into a polymeric latex composition. This latex composition is used to encapsulate the yarn tufts and as an adhesive between the primary and secondary backings. The underside of the primary backing is coated with this fluorochemical-containing latex.

For instance, Ucci, US Patent 4,643,930, Blyth et al., US Patent 4,619,853, and Ucci, US Patent 4,579,762 each disclose a carpet structure having a primary backing tufted with nylon yarns. The underside of the primary backing is coated with a polymeric latex containing fluorochemicals mixed therein such that the primary backing is made substantially impervious to water.

As described in Vinod, US Patent 5,348,785, it is also known to make carpets having a secondary backing which is substantially impervious to aqueous solutions. This process involves applying a fluorochemical solution to the underside of a secondary backing and then drying

the fluorochemical solution. However, it would be desirable to have a process where the fluorochemical solution could be applied to the secondary backing in a more effective and economically feasible manner. The present invention provides such a process.

GB 1 409 068 describes a process, where a secondary backing is applied to a tufted primary by laying the secondary backing material on the primary backing and then applying foam to the outer surface of the secondary backing such that latex penetrates into and through the secondary backing to encapsulate the tufts of the primary backing. The patent further discloses that sufficient latex remains around the outer surface of the constituent yarns of the secondary backing to effect a degree of encapsulation of such yarns and to provide adequate adhesion of the secondary backing.

It has now been found that the secondary backing of a carpet may be rendered impermeable to liquids by applying a continuous coating of hydrophobic polymeric latex to the outer surface of the secondary backing. The hydrophobic polymeric latex may be a modified latex containing fluorochemicals or repellent finishes dispersed therein. The present invention provides a carpet having a primary backing which is permeable to liquids and a secondary backing which is substantially impervious to liquids.

SUMMARY OF THE INVENTION

This invention is directed to a method for constructing a carpet having a primary backing which is permeable to liquids and a secondary backing which is substantially impervious to liquids. This method involves applying an adhesive to the underside of a tufted primary backing in order to lock the tufts into place. Preferably, the adhesive is an adhesive latex. A secondary backing is then adhered to the adhesive latex-coated primary backing. A continuous coating of hydrophobic polymeric latex is then applied to the outer surface of the secondary backing. This latex coating may

be applied by various means including foam, spray, or padding methods. This hydrophobic latex coating may be a modified latex containing fluorochemicals mixed therein. The modified latex may contain repellent finishes in addition to or in place of the fluorochemicals. The hydrophobic latex coating is applied to the secondary backing in an amount sufficient to render the secondary backing substantially impervious to liquids. The constructed carpet including the hydrophobic latex coating is then dried for a sufficient amount of time to render the secondary backing substantially impervious. The carpet may be dried by passing it through an oven at an oven temperature in the range of 250° to 400°F. Alternatively, the carpet may be dried at room temperature. Preferably, the primary and secondary backing are polypropylene materials and the primary backing is tufted with nylon yarn. The hydrophobic polymeric latex coating may also be applied to the underside of a finished carpet to render the secondary backing substantially impervious to liquids. This invention also includes carpets produced from the above-described methods.

BRIEF DESCRIPTION OF THE FIGURES

Figure 1 is a schematic view of a method of the present invention illustrating the foam application of a hydrophobic latex coating to the outer surface of a secondary backing.

Figure 2-A is an enlarged view of the foam system shown in Figure 1.

Figure 2-B is an enlarged view of the foam system shown in Figure 1 illustrating the foam delivery tube extending over the lower press roll.

DETAILED DESCRIPTION OF THE INVENTION

The present invention provides a process for constructing a carpet having a primary backing which is permeable to liquids and a secondary backing which is substantially impervious to liquids. A continuous coating

of "hydrophobic polymeric latex" is applied to the outer surface of the secondary backing in a sufficient amount to render the secondary backing of the carpet "substantially impervious" to liquids.

By the term "hydrophobic polymeric latex" as used herein, it is meant a hydrophobic, film-forming, synthetic latex in the form of an emulsion and made from such materials as, for example, carboxylated acrylate polymer, carboxylated styrene/acrylate copolymers, carboxylated vinylidiene chloride/butadiene copolymers, carboxylated styrene/butadiene, ethylene/vinyl acetate copolymers, polyacrylates, acrylates, polychloroprene, and elastomers as well as blends of the foregoing materials. Generally, the hydrophobic polymeric latex formulation should contain about 20% to about 80% by weight of a latex polymer as described above. Preferably, the hydrophobic latex coating consists essentially of a latex polymer selected from the above polymers. However, it should be recognized that the amount of latex polymer active ingredient in a given formulation will be adjusted depending on the desired viscosity, fabric coverage, coating rate, and other process specifications.

The hydrophobic latex formulation may also include a minor amount of fillers, such as calcium carbonate, silica, talc, or clay. Generally, the amount of such fillers dispersed in the latex should be in the range of about 0% to about 50% and preferably in the range of about 0% to about 10% by weight of latex. Additionally, the hydrophobic polymeric latex may include a thickening agent such as various organic or inorganic gums, wetting agents, foaming agents, colorants, antimicrobials and other additives in minor amounts.

By the phrase, "substantially impervious to liquids" as used herein, it is meant that water, aqueous solutions (e.g., coffee, wine, soda, or fruit juice), or non-aqueous solutions (e.g., mineral oil or alcohol) will not substantially penetrate through the secondary backing in accordance with the testing methods described below.

Generally, the pile yarns for the carpets of this invention may be prepared by conventional techniques. These yarns are composed of multiple filaments which are formed from synthetic or natural polymers, such as wool. Typical synthetic fiber-forming polymers include, for example, polyolefins such as polypropylene, polyamides such as polyhexamethylene adipamide (nylon 6,6) and polycaprolactam (nylon 6), polyesters such as polyethylene terephthalate, and acrylics. Copolymers, terpolymers, and melt blends of such polymers are also suitable.

In a nylon-filament forming process, the molten polymer is extruded through a spinneret into a quenching medium, where the polymer cools and solidifies to form filaments. After drawing, the filaments may be crimped and cut into short lengths to make staple fiber, or bulked to make bulked continuous filaments (BCF). A fluorochemical finish may be applied during the fiber-forming process (producer-applied fluorochemical).

After additional yarn processing steps, the BCF or staple spun yarns may then be tufted into a primary backing fabric by techniques known in the trade. Alternatively, the carpets can be woven or needle-punched. The primary backing may be a woven material made from natural or synthetic materials, such as, jute, wool, rayon, polyamides, polyesters, or polyolefins. Nonwoven backings may also be used. The carpet is then typically dyed, rinsed, and subjected to other standard finishing operations including stain-resist and soil-resist treatment of the yarn tufts.

An "adhesive latex" is then applied to the underside of the primary backing fabric to lock the tufts in place and to provide an adhesive for a secondary backing material. By the term "adhesive latex" as used herein, it is meant a water emulsion of synthetic rubber, natural rubber, or other polymer, such as, for example, styrene/butadiene copolymers, ethylene/vinyl acetate copolymers, polyacrylates, and blends thereof. The adhesive latex typically includes a high concentration of filler material such as calcium carbonate, silica, talc,

or clay. However, in this invention, it is important that the adhesive latex not contain any additives which would render the primary backing impermeable to liquids. The primary carpet backings of this invention are permeable to liquids. Any liquids which spill onto the carpet should not excessively spread across the face fiber but should penetrate through the primary backing. Generally, the amount of adhesive latex applied to the primary backing is in the range of about 18 to 40 ounces per square yard of primary backing fabric. Alternatively, the primary backing may be coated with a hot melt adhesive as described in Reith, US Patent Nos. 4,844,765 and 4,939,036.

The adhesive latex-coated tufted primary backing is then brought in contact with a secondary backing material having an "inner surface" and "outer surface". By the term, "inner surface", it is meant the surface of the secondary backing material which is in contact with the underside of the primary backing material. By the term, "outer surface", it is meant the surface of the secondary backing material opposing the inner surface of the primary backing material. Different secondary backing materials known in the trade may be used including jute, woven tapes of polypropylene, plain woven polypropylene fabrics, felts, and thermoplastic polymer films. Often, the inner surface of the secondary backing will also be coated with a small amount of latex to improve the adhesiveness between the latex-coated underside of the primary backing and the secondary backing. This adhesive latex also should not contain any additives which would render the primary backing impermeable to liquids. Referring to Figure 1, the contacted primary (1) and secondary (2) backings adhere to each other as the backings pass over the marriage roll (4).

After the primary and secondary backings have been brought into contact with each other, a continuous coating of hydrophobic polymeric latex is then applied to the outer surface of the secondary backing material.

In order to make the hydrophobic polymeric latex formulation more effective in reducing liquid permeability through the secondary backing, the latex formulation may contain fluorochemicals and/or other repellent finishes dispersed therein. However, as shown in the Examples below, it is not necessary to add fluorochemicals and/or other repellent finishes to the latex. If used, the amount of fluorochemicals or repellent finishes dispersed in the latex formulation is generally about 1% to about 10% by weight based on weight of latex. This upper limit of 10% is due to cost considerations. Amounts greater than 10% may be used but may not be economically feasible depending on the costs of the fluorochemicals or repellents.

Suitable fluorochemicals which may be dispersed in the hydrophobic polymeric latex formulation used for coating the outer surface of the secondary backing include, but are not limited to, polymers or compounds with molecular weights of greater than 500 having pendent or end groups of perfluoroalkyl moieties. Examples of some suitable fluorochemicals include polyvinyldiene fluoride, polytetrafluoroethylene, 2-perfluorooctylethyl acrylate and blends of such compounds with polymers of methyl methacrylate, butyl methacrylate, and ethyl methyl acrylate, and modified wax emulsions, and polyvinylidene chloride. Commercially available fluorochemicals such as "TEFLON", "DURATECH", and "ZONYL" from DuPont Co., "MILEASE" from ICI, "ASAHIGARD" from Asahi, "SCOTCHGARD" from 3M, "SOFTECH" from Dyetech, "TEX-TEL" from Atochem, and "NK GUARD" from Nicca, may be used. These commercial fluorochemicals are typically available as dispersions, where the fluorochemicals are dispersed in water and these dispersions are commonly referred to as fluorochemical solutions. The fluorochemical solutions may be mixed with the latex polymer to form a modified hydrophobic latex.

It is also recognized that the hydrophobic polymeric latex formulation may contain a "repellent finish" in addition to the fluorochemicals or in lieu of the fluorochemicals. By the term "repellent finish" as

used herein, it is meant a finish comprising repellent chemicals such as silicone-based compositions, wax emulsions, and naturally occurring oils, (or mixtures thereof) dispersed, suspended, or dissolved in a solvent such as water or alcohol. The finish may also contain surfactants, foaming agents, and other additives. These repellent finishes may be mixed with the latex polymer to form a modified hydrophobic latex.

The hydrophobic latex coating may be applied to the outer surface of the secondary backing by various means, including foaming, spraying, or padding methods. Figure 1 illustrates a foam system for applying the latex in the form of foam to the outer surface of the secondary backing against the force of gravity. After the foam has been applied, the primary and secondary backing materials are passed between upper (5) and lower (6) press rolls, whereby the primary and secondary backing materials are pressed together and laminated.

The entire carpet structure is then subjected to heat-treatment in order that the latex adhesive between the primary and secondary backings may be dried and the hydrophobic latex coating on the outer surface of the secondary backing may be dried. Typically, the carpet structure will be positioned on a tenter frame and passed through a conventional latex curing oven (7). Although the heating temperature may vary depending upon the type of pile yarn, latex compositions, repellent finish, and backing materials used, the temperature inside the oven should generally be in the range of 250° to 400°F. Alternatively, the carpet structure may be dried at room temperature. In either event, it is important that the carpet structure and hydrophobic latex coating be dried for a sufficient amount of time in order that the secondary backing is rendered substantially impermeable.

It has also been found that a continuous coating of hydrophobic polymeric latex may be applied to the underside of a "finished carpet" to render the secondary backing substantially impervious. This latex coating may also contain fluorochemicals dispersed therein. By the

term, "finished carpet" as used herein, it is meant a carpet having a primary backing with tufts of yarn projecting therefrom which is permeable to liquids and which is adhered to a secondary backing material by an adhesive which has dried.

The methods and resultant carpets of this invention offer advantages over carpets of the prior art. In contrast to many carpets having a tufted primary backing which has been coated on its underside with a fluorochemical-containing adhesive latex, the delamination strength and tuftbind of the carpets in this invention are not reduced. As described above, in carpets having a tufted primary backing which has been coated with a fluorochemical-containing adhesive latex, there is often reduced adhesion between the primary and secondary backings due to the pre-mixing of the fluorochemicals into the adhesive latex.

In a preferred embodiment, the hydrophobic latex coating is applied to the outer surface of the secondary backing by a foam applicator (8) subsequent to the primary and secondary backings passing over the marriage roll (4) and prior to the backings passing between the upper and lower press rolls (5,6). In such a method, a foamable latex containing foaming agents is first prepared. Suitable foaming agents include KAF 300S, available from Peach State Labs, Dextrol Foamer 916, available from Dexter Chemicals, Inc., Mykon NRW3 available from Sequa, Arquad 12-50 or Arquad 12-37 available from Akzo Chemicals, and Stanfax 238, available from Standard Adhesives. As discussed above, the foamable latex may also contain fluorochemicals.

The foamable latex can then be generated into foam and applied through a commercial foam generator. It is important that the foam be stable in order that it may be applied uniformly along the secondary backing. The latex should be applied as a continuous coating. The foam application conditions may be adjusted to obtain the desired percentage of fluorochemicals in the foamable mixture, flow rate of the foamable mixture, speed of the

carpet through the oven (dryer speed), and blow ratio (ratio of the volume of air to the volume of foamable mixture).

As shown in Figure 1, one method of foam application involves feeding the carpet (1) on a moving carpet line in such a manner that the face of the carpet, i.e,, the pile, is directed upwards and the secondary backing rests on the carpet line, i.e., the tenter frame. The carpet line is located above a rotating lower press roll (6), and the foam system (8) includes a foam manifold connected to a foam generator. Referring to Figure 2-A, the foam is introduced from the manifold (11) through a foam delivery tube (12) to form a bank of foam in the nip area between the carpet and rotating lower press roll (6). This bank of foam is formed in the triangular-like area marked as (A) in Figure 2-A, and the foam is applied to the secondary backing by means of the rotating lower press roll and the moving carpet. The foam is effectively applied, because it collapses at the nip point between the lower press roll and secondary backing. A nip slide or dam device (13) may be installed to hold excess foam near the lower press roll, until the foam is picked-up and nipped onto the secondary backing by rotation of the roll through the foam puddle.

The position of the foam delivery tube (12) and the nip slide device (13) in relation to the lower press roll (6) is important. First, the delivery tube should be positioned so that foam is delivered onto the upper sector of the press roll (6), as shown in Figure 2-A, in order that the foam can be more uniformly nipped onto the secondary backing and that any excess foam will slide downwards along the roll to be collected by the nip slide (13). This is accomplished by having the outlet of the delivery tube extend over the lower press roll as shown in Figure 2-B. The diameter of the lower press roll is generally in the range of about 6 to 18 inches, and the distance from the outlet of the delivery tube to the press roll should be in the range of about 1/4th to 3 inches. Secondly, the delivery tube (12) should be positioned so

that there is no contact between the tube and the carpet. Thus, the delivery tube may be angled downwards as shown in Figure 2-B. The angle of the delivery tube (to the horizontal) may nominally be in the range of about 10 to 25 degrees. Also, the height of the manifold (11) should be adjusted so that there is no contact between the manifold and the carpet. Thirdly, the nip slide (13) should be positioned so that it will collect any excess foam which falls downward along the upper sector of the press roll (6). Thus, one end of the nip slide (13) is located at about the midpoint of the press roll (6), i.e. the 3:00 position on the face of press roll as shown in Figure 2-A. The other end of the nip slide (13) is positioned under the inlet portion of the delivery tube (12). Referring to Figure 2-B, the angle of the nip slide (to the horizontal) may nominally be in the range of about 5 to 45 degrees. As shown in Figure 2-B, the length (L) of an individual delivery tube should slightly exceed the width (W) of the nip slide in order for the foam to be delivered onto the lower press roll (6). It is recognized that there will be multiple foam delivery tubes in order to uniformly treat the secondary backing. For example, there may be 16 delivery tubes per carpet line for treating carpets having 12 foot widths.

The speed of the rotating lower press roll (6) and the carpet line may be the same or different. The lower press roll can run in the same direction as the carpet or in the reverse direction of the carpet. Typically, the speed of the carpet line is in the range of 20 to 200 feet per minute, and the speed of the nip roll is in the range of 50% to 200% of the speed of the carpet line (reverse direction) or 50% to 300% (same direction).

In cases where a "non-modified hydrophobic latex coating" (i.e., a latex formulation which does not contain fluorochemicals and/or other repellent finishes) is applied to the outer surface of the secondary backing, the amount of latex applied is typically in the range of about 1 to about 10 ounces per square yard of secondary backing

and is preferably in the range of about 2 to about 4 ounces per square yard.

In cases where a "modified hydrophobic latex coating" (i.e., a latex formulation which contains fluorochemicals and/or other repellent finishes) is applied to the outer surface of the secondary backing, the amount of latex applied is typically in the range of about 1 to about 5 ounces per square yard of secondary backing and is preferably in the range of about 1 to about 3 ounces per square yard.

Typically, commercially available repellent finishes, including fluorochemical solutions, contain about 0.5 to about 40% by weight total active ingredient. In the case of silicones, the amount of the total active ingredient may be greater than 40% by weight. In this invention for modified hydrophobic latex coatings, the amount of fluorochemical or other repellent active ingredient applied will be generally in the range of about 0.01 to about 5.00 ounces per square yard of secondary backing, and approximately the same amounts may be applied in either foam or spray application. Preferably, about 0.05 to about 3.00 ounces of fluorochemical or other repellent active ingredient per square yard of secondary backing is applied. However, it is understood that the amount of fluorochemical/repellent active ingredient applied will be adjusted depending upon the type and concentration of the repellent, amount of fluorochemical (soil resist agent) on the face fiber, carpet construction, density of carpet face fiber, type of carpet face fiber, tightness or closeness of the secondary backing (woven or non-woven), and the amount and type of latex used. In any event, it is important that a sufficient amount of hydrophobic polymeric latex be uniformly applied to the outer surface of the secondary backing in order that the secondary backing is rendered impervious to liquids in accordance with the Staining Test as described under "Testing Methods" below. As discussed above, the latex may be a non-modified hydrophobic latex or a modified hydrophobic latex.

The present invention is further illustrated by the following examples, but these examples should not be considered as limiting the scope of the invention.

Testing Methods

Staining Test:

Mix 45 grams of a cherry flavored, sugar sweetened, Kool-Aid powder in 500 ml of water. Allow solution to reach room temperature (75 +/- 5°F) before using. Place the carpet sample with the secondary backing touching a white absorbent paper towel or blotter paper. Pour 20 ml of Kool-Aid onto the carpet sample from the face fiber side through a 1-1/2" diameter cylinder from a height of about 6 cm. to create a circular stain. Remove cylinder and mechanically work the solution into the tufts, e.g., by hand, in order to obtain uniform staining. Let the sample stay undisturbed for 30 minutes. Lift the sample at the end of 30 minutes and look for visual red staining on the white absorbent paper. Room temperature water can be substituted for the Kool-Aid solution as a staining liquid. If considerable amount of a staining solution has passed through the carpet sample, a severe staining will be visible. The sample will be termed as substantially impervious if none or a very slight amount of liquid has passed through the carpet sample leaving none or a few visible drops of staining on a white absorbent towel or blotter paper.

EXAMPLES

Example 1

A residential cut pile carpet sample (about 5/8" pile height; 33 oz./yd^2 weight) was produced by a conventional mill process. The pile surface of the carpet was treated with topical stain resist and fluorochemical agents according to standard mill procedures. The carpet was composed of nylon 6,6 BCF face fiber, a woven polypropylene primary backing, an adhesive latex and a woven polypropylene secondary backing. The adhesive latex was composed of a mixture of a carboxylated styrene

butadiene rubber, calcium carbonate, water, a thickening agent and a foaming agent. Approximately 28-30 oz/yd^2 of this foamed adhesive latex was applied to the primary backing, and the primary and secondary backings were adhered together.

Prior to the latex curing oven, the outer surface of the secondary backing was treated with a foam application of about 2 ounces per square yard of the following specially formulated modified latex:

- 3 parts of a carboxylated acrylate latex polymer (38-45% active ingredient), available from Dow Chemicals, Midland, MI as XUR 1540-1156-1 experimental latex diluted with 1 part water, by weight,
- 5% by weight of an aqueous solution "Zonyl" 1250 fluorochemical solution (15-20% active ingredient), available from the DuPont Company, based on the weight of the latex polymer, and
- 10 grams/liter of a foaming agent, KAF 300S, available from PeachState Labs, based on the total mixture of latex polymer, "Zonyl" 1250 fluorochemical solution, and water.

The treated carpet sample was then passed through a latex curing oven at an oven temperature of 350° to 400°F and the latex was dried. The carpet sample was then cooled to room temperature before being subjected to the Staining Test.

A sample from the treated carpet was placed on blotter paper and was stained with Kool-Aid as described in the above Staining Test under "Testing Methods". The carpet sample was substantially impervious to the Kool-Aid stain.

Another sample from the treated carpet was placed on blotter paper and was stained as described in the Staining Test with the exception that hot coffee (150°F) was substituted for Kool-Aid as the staining agent. The carpet sample was substantially impervious to the hot coffee stain.

Comparative Example A

A carpet sample was prepared as described in above Example 1, except the outer surface of the secondary backing was not treated with a coating of modified latex or a coating of non-modified latex. A sample from the untreated carpet was placed on blotter paper and was stained with Kool-Aid as described in the Staining Test. The blotter paper was severely stained by the Kool-Aid.

Another sample from the untreated carpet was placed on blotter paper and was stained as described in the Staining Test with the exception that hot coffee (150°F) was substituted for Kool-Aid as the staining agent. The blotter paper was severely stained by the coffee stain.

Comparative Example B

In this comparative example, the woven polypropylene secondary backing was removed from the treated carpet in Example 1 to provide a carpet having a tufted primary backing with a coating of adhesive latex on its underside. A sample from this carpet was placed on blotter paper and was stained with Kool-Aid as described in the Staining Test. The blotter paper was severely stained by the Kool-Aid, indicating that treating the outer surface of the secondary backing with the modified latex coating was not sufficient to render the primary backing impermeable in accordance with the Staining Test.

Example 2

A residential cut carpet sample pile (about 5/8" pile height; 33 oz/yd^2 weight) was produced by a conventional mill process. The pile surface of the carpet was treated with topical stain resist and fluorochemical agents according to standard mill procedures. The carpet was composed of nylon 6,6 BCF face fiber, a woven polypropylene primary backing, an adhesive latex and a woven polypropylene secondary backing. The adhesive latex was composed of a mixture of a carboxylated styrene butadiene rubber, calcium carbonate, water, a thickening agent and a foaming agent. Approximately 28-30 oz/yd^2 of

this foamed adhesive latex was applied to the primary backing, and the primary and secondary backings were adhered together.

Prior to the latex curing oven, the outer surface of the secondary backing was treated with a foam application of about 2 ounces per square yard of the following specially formulated modified latex:

- 3 parts of a carboxylated vinylidene chloride/butadiene latex polymer (45-52% active ingredient), available from Dow Chemicals, Midland, MI as XUR 1540-1157-1 experimental latex diluted with 1 part water, by weight,
- 5% by weight of an aqueous solution of "Zonyl" 1250 fluorochemical solution, available from the DuPont Company, based on the weight of the latex polymer, and
- 10 grams/liter of a foaming agent, KAF 300S, available from PeachState Labs, based on the total mixture of latex polymer, "Zonyl" 1250 fluorochemical solution, and water.

The treated carpet sample was then passed through a latex curing oven at an oven temperature of 350° to 400 °F and the latex was dried. The carpet sample was then cooled to room temperature before being subjected to the Staining Test.

A sample from the treated carpet was placed on blotter paper and was stained with Kool-Aid as described in the Staining Test. The carpet sample was substantially impervious to the Kool-Aid stain.

Another sample from the treated carpet was placed on blotter paper and was stained as described in the Staining Test with the exception that hot coffee (150°F) was substituted for Kool-Aid as the staining agent. The carpet sample was substantially impervious to the hot coffee stain.

Comparative Example C

A carpet sample was prepared as described in above Example 2, except the outer surface of the secondary backing was not treated with a modified or a non-modified

latex. A sample from the untreated carpet was placed on blotter paper and was stained with Kool-Aid as described in the Staining Test. The blotter paper was severely stained by the Kool-Aid.

Another sample from the untreated carpet was placed on blotter paper and was stained as described in the Staining Test with the exception that hot coffee (150°F) was substituted for Kool-Aid as the staining agent. The blotter paper was severely stained by the coffee stain.

Comparative Example D

In this comparative example, the woven polypropylene secondary backing was removed from the treated carpet in Example 2 to provide a carpet having a tufted primary backing with a coating of adhesive latex on its underside. A sample from this carpet was placed on blotter paper and was stained with Kool-Aid as described in the Staining Test. The blotter paper was severely stained by the Kool-Aid, indicating that treating the outer surface of the secondary backing with the modified latex was not sufficient to render the primary backing impermeable in accordance with the Staining Test.

Example 3

Two residential cut pile carpet samples (about 5/8" pile height; 33 oz/yd^2 weight) were produced by a conventional mill process. The pile surface of the carpet was treated with topical stain resist and fluorochemical agents according to standard mill procedures. The carpet samples were composed of nylon 6,6 BCF face fiber, a woven polypropylene primary backing, an adhesive latex and a woven polypropylene secondary backing. The adhesive latex was composed of a mixture of a carboxylated styrene butadiene rubber, calcium carbonate, water, a thickening agent and a foaming agent. Approximately 28-30 oz/yd^2 of this foamed adhesive latex was applied to the primary backing, and the primary and secondary backings were adhered together. The carpet samples was then passed

through a latex curing oven at an oven temperature of 350 to 400°F and the latex was dried to form two finished carpet samples.

The underside of both finished carpet samples were sprayed with about 3 ounces per square yard of the following non-modified latex formulation:

- a carboxylated acrylate latex polymer (38-45% active ingredient), available from Dow Chemicals, Midland, MI as XUR 1540-1156-1 experimental latex.

Both carpet samples (Sample A and Sample B) were then dried in an oven at an oven temperature of 250°F for 20 minutes. The samples were then cooled to room temperature before being subjected to the following tests.

Sample A was placed on blotter paper and was stained with Kool-Aid as described in the Staining Test. The carpet sample was substantially impervious to the Kool-Aid stain.

Sample B was placed on blotter paper and was stained as described in the Staining Test with the exception that hot coffee (150°F) was substituted for Kool-Aid as the staining agent. The blotter paper was visibly stained with coffee.

Example 4

A residential cut pile carpet sample (about 5/8" pile height; 33 oz/yd^2) was produced by a conventional mill process. The pile surface of the carpet was treated with topical stain resist and fluorochemical agents according to standard mill procedures. The carpet was composed of nylon 6,6 BCF face fiber, a woven polypropylene primary backing, an adhesive latex and a woven polypropylene secondary backing. The adhesive latex was composed of a mixture of a carboxylated styrene butadiene rubber, calcium carbonate, water, a thickening agent and a foaming agent. Approximately 28-30 oz/yd^2 of this foamed adhesive latex was applied to the primary backing, and the primary and secondary backings were adhered together.

Prior to the latex curing oven, the outer surface of the secondary backing was treated with a foam application of about 3 ounces per square yard of the following non-modified latex formulation:

- A carboxylated acrylate latex polymer (38-45% active ingredient), available from Dow Chemicals, Midland MI as XUR 1540-1156-1 experimental latex and 10 grams/liter of a foaming agent, KAF 300S, available from the PeachState Labs.

The treated carpet sample was then passed through a latex curing oven at an oven temperature of 350 to 400°F and the latex was dried. The carpet sample was then cooled to room temperature before being subjected to the Staining Test.

A sample from the treated carpet was placed on blotter paper and was stained with Kool-Aid as described in the Staining Test. The carpet sample was substantially impervious to the Kool-Aid stain.

Another sample from the treated carpet was placed on a blotter paper and was stained as described in the Staining Test with the exception that the hot coffee (150°F) was substituted for Kool-Aid as the staining agent. The blotter paper was moderately stained with coffee and this sample did not pass the Staining Test.

Example 5

A residential cut pile carpet sample (about 5/8" pile height; 33 oz./yd^2 weight) was produced by a conventional mill process. The pile surface of the carpet was treated with topical stain resist and fluorochemical agents according to standard mill procedures. The carpet was composed of nylon 6,6 BCF face fiber, a woven polypropylene primary backing, an adhesive latex and a woven polypropylene secondary backing. The adhesive latex was composed of a mixture of a carboxylated styrene butadiene rubber, calcium carbonate, water, a thickening agent and a foaming agent. Approximately 28-30 oz/yd^2 of this foamed adhesive latex was applied to the primary

backing, and the primary and secondary backings were adhered together.

After exiting the latex curing oven (temperature of 350° to 400°F), the outer surface of the secondary backing was treated with a hydrophobic polymeric latex consisting essentially of a latex polymer (as described below in Table I) and not containing any fillers, fluorochemicals, or other repellent finishes. The hydrophobic latex was applied to the secondary backing by brushing the latex coating onto the backing until the entire surface was covered.

TABLE I

Trade Name and Company	Latex, Chemical Description	Coating Solids (Grams/Sq. Yard)
CONTROL	NONE	NONE
Dow Corning Fabric Coating 60	silicone elastomer	450
Dow Corning Fabric Coating 61	silicone elastomer	320
DuPont Neoprene 2161	polyvinyl chloride	545
DuPont Neoprene 115	polyvinyl chloride	410
DuPont Neoprene 2900	polyvinyl chloride	420
Air Products Airflex 4500	polyvinyl chloride	685
Air Products Airflex 4530	polyvinyl chloride	660
Air Products Airflex 420	acrylic copolymer	400
Air Products Airflex 405	polyvinyl acetate	640
Air Products Airflex 410	polyvinyl acetate	380
Air Products Airflex 430	polyvinyl chloride	720
Air Products Airflex 460	polyvinyl acetate	465
Air Products Airflex 4514	vinyl chloride/ethylene/ acrylamide terpolymer	875
B.F. Goodrich Hycar 1552	butadiene/acrylonitrile copolymer	365
B.F. Goodrich Hycar 2671	acrylic polymer	300
B.F. Goodrich Hycar 2679	acrylic polymer	385
B.F. Goodrich Hycar 26138	acrylic polymer	545
B.F. Goodrich Hycar 11572X64	acrylic polymer	465
B.F. Goodrich Hystretch V43	ethyl acrylate and acrylamide polymers	375
B.F. Goodrich Hystretch V60	ethyl acrylate and acrylamide polymers	375
B.F. Goodrich Good-rite 2570X59	styrene/butadiene copolymer	520

The carpet samples treated with the above-described hydrophobic polymeric latexes were placed on blotter paper and stained with Kool-Aid as described in the above Staining Test under "Testing Methods". Each of these carpet samples were substantially impervious to the Kool-Aid Stain.

The "Control" carpet sample, as described above, was placed on blotter paper and stained with Kool-Aid as described in the Staining Test. The blotter paper was severely stained by the Kool-Aid.

CLAIMS:

1. A method for constructing a carpet having a primary backing which is permeable to liquids and a secondary backing which is substantially impervious to liquids, comprising the steps of:

a) applying an adhesive to a tufted primary backing material;

b) contacting the adhesive coated primary backing material with a secondary backing material having an inner and outer surface;

c) applying a continuous coating of hydrophobic polymeric latex to the outer surface of the secondary backing in a sufficient amount to render the secondary backing substantially imepervious to liquids; and

d) drying the carpet and hydrophobic latex coating to form a carpet having a primary backing which is permeable to liquids and a secondary backing which is substantially impervious to liquids.

2. The method of claim 1, wherein the adhesive is a latex of a polymer selected from the group consisting of styrene/butadiene copolymers, ethylene/vinyl acetate copolymers, polyacrylates, and blends thereof.

3. The method of claim 1, wherein the hydrophobic polymeric latex coating on the outer surface of the secondary backing consists essentially of a polymer selected from the group consisting of styrene/acrylate copolymers, vinylidiene/butadiene copolymers, styrene/butadiene copolymers, ethylene/vinyl acetate copolymers, polyacrylates, acrylates, polychloroprene, elastomers and blends thereof.

4. The method of claim 3, wherein the amount of hydrophobic latex coating applied to the outer surface of the secondary backing is in the range of about 1 to about 10 ounces per square yard of secondary backing.

5. The method of claim 1, wherein the hydrophobic latex coating on the outer surface of the secondary backing contains fluorochemicals dispersed therein.

6. The method of claim 5, wherein the amount of hydrophobic latex coating applied to the outer surface of the secondary backing is in the range of about 1 to about 5 ounces per square yard of secondary backing.

7. The method of claim 1, wherein the tufted primary backing comprises tufts of nylon yarns, and the primary and secondary backings are polypropylene materials.

8. The method of claim 1, wherein the hydrophobic latex coating is dried by heating the carpet in an oven at an oven temperature in the range of 250° to 400°F.

9. The method of claim 1, wherein the hydrophobic latex coating is dried at room temperature.

10. A method for rendering a secondary backing of a finished carpet substantially impervious to liquids, comprising applying a sufficient amount of hydrophobic polymeric latex to the underside of the carpet to render the secondary backing substantially impervious to liquids.

11. The method of claim 10, wherein the hydrophobic latex coating on the underside of the carpet contains fluorochemicals dispersed therein.

12. A carpet having a tufted primary backing which is permeable to liquids and a secondary backing which is substantially impervious to liquids, said secondary backing having inner and outer surfaces, wherein the tufted primary backing is adhered to the inner surface of the secondary backing by means of an adhesive and the

outer surface of the secondary backing has a continuous coating of hydrophobic polymeric latex.

13. The carpet of claim 12, wherein the adhesive is a latex of a polymer selected from the group consisting of styrene/butadiene copolymers, ethylene/vinyl acetate copolymers, polyacrylates, and blends thereof.

14. The carpet of claim 12, wherein the hydrophobic latex coating on the outer surface of the secondary backing consists essentially of a polymer selected from the group consisting of styrene/acrylate copolymers, vinylidiene/butadiene copolymers, styrene/butadiene copolymers, ethylene/vinyl acetate copolymers, polyacrylates, acrylates, polychloroprene, elastomers and blends thereof.

15. The carpet of claim 14, wherein the amount of hydrophobic latex coating on the outer surface of the secondary backing is in the range of about 1 to about 10 ounces per square yard of secondary backing.

16. The carpet of claim 12, wherein the hydrophobic latex coating on the outer surface of the secondary backing contains fluorochemicals dispersed therein.

17. The carpet of claim 16, wherein the amount of hydrophobic latex coating applied on the outer surface of the secondary backing is in the range of about 1 to about 5 ounces per square yard of secondary backing.

18. The carpet of claim 12, wherein the tufted primary backing comprises tufts of nylon yarns and the primary and secondary backings are polypropylene materials.

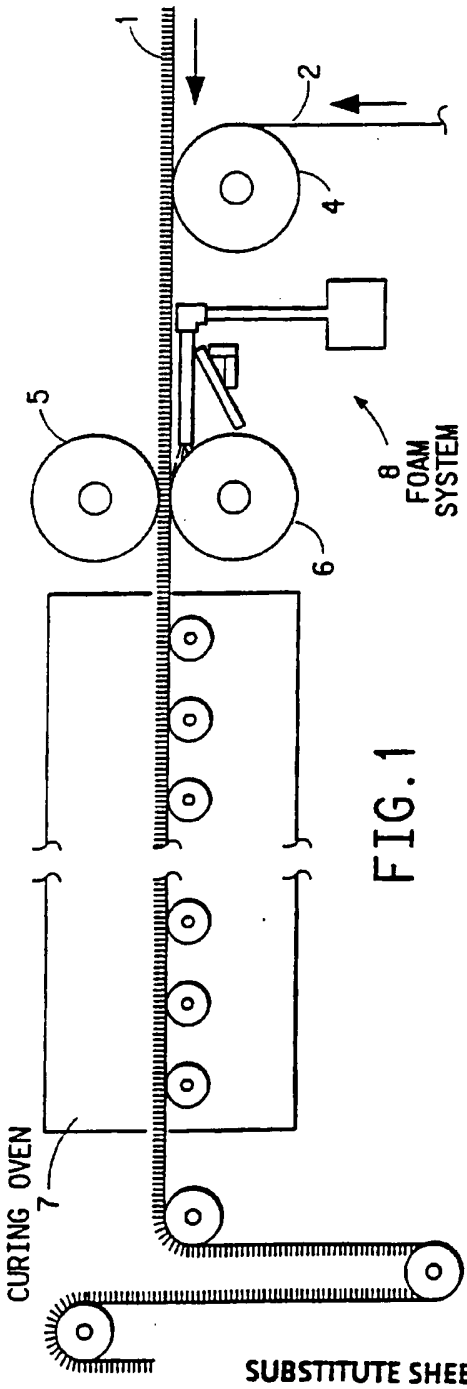

FIG. 1

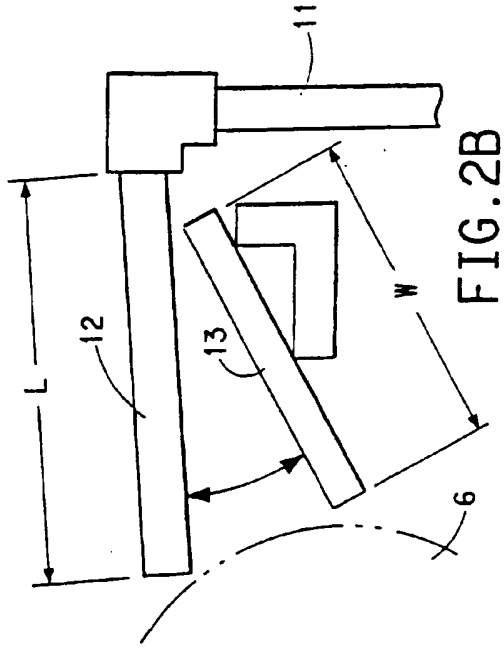

FIG. 2B

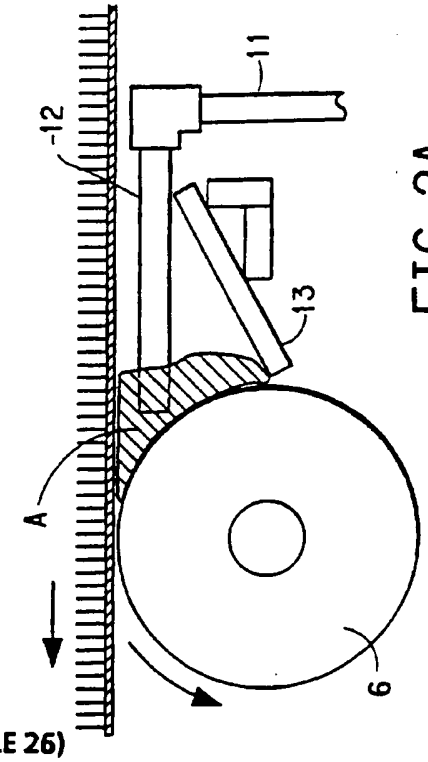

FIG. 2A

INTERNATIONAL SEARCH REPORT

Intern. al Application No
PCT/US 96/00329

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 D06N7/00 B32B5/22

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 D06N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,X	EP,A,0 662 541 (DU PONT) 12 July 1995 cited in the application see claims; example 8	1-4, 7-10, 12-15, 17,18
X	EP,A,0 384 420 (BAYERISCHE MOTOREN WERKE AG ;DURA TUFTING GMBH) 29 August 1990 see column 7, paragraph 2; claims; figure 5	1-4,6, 12-14
X	EP,A,0 266 959 (WILTON ROYAL CARPETS LTD) 11 May 1988 see column 3; claims 1-3	10,12

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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"&" document member of the same patent family

1

Date of the actual completion of the international search	Date of mailing of the international search report
14 May 1996	28 -05- 1996

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+ 31-70) 340-2040, Tx. 31 651 epo nl, Fax (+ 31-70) 340-3016	Pfannenstein, H

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INTERNATIONAL SEARCH REPORT

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB,A,1 409 068 (SYNTHETIC FAB SCOTLAND LTD) 8 October 1975 cited in the application see claims; examples	10, 12-14, 17,18

1

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INTERNATIONAL SEARCH REPORT

...ormation on patent family members

Interna l Application No
PCT/US 96/00329

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
EP-A-0662541	12-07-95	US-A-	5348785	20-09-94
		AU-B-	1005095	20-07-95
		CA-A-	2139408	08-07-95
		CN-A-	1110732	25-10-95
		JP-A-	7305260	21-11-95
EP-A-0384420	29-08-90	DE-A-	3905607	30-08-90
		JP-A-	3000233	07-01-91
		JP-B-	6098727	07-12-94
EP-A-0266959	11-05-88	US-A-	4892056	09-01-90
GB-A-1409068	08-10-75	AU-B-	465352	25-09-75
		AU-B-	5822973	23-01-75
		CA-A-	1003739	18-01-77
		CH-B-	566825	30-09-75
		CH-A-	1049973	30-04-75
		DE-A-	2337335	14-02-74
		FR-A,B	2194568	01-03-74
		JP-A-	49085363	15-08-74
		LU-A-	68091	03-10-73
		NL-A-	7310377	29-01-74
		SE-B-	405459	11-12-78
		BE-A-	802809	28-01-74